COMPARISON BETWEEN GAMBANG RESIDUAL SOIL AND BENTONG RESIDUAL SOIL IN TERMS OF COLLAPSIBILITY

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I declare that this thesis entitled "*Comparison between Gambang residual soil and Bentong residual soil in terms of collapsibility*" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

Residual soils are products of chemical weathering and thus their characteristics are dependent upon environmental factors of climate, parent material, topography and drainage, and age. Residual soils with extensive weathering of parent materials can yield collapsible soil deposits. Nowadays, most of tragedy that cause by collapsibility of residual soil occurs very extensively, for example the incident at Bukit Antarabangsa which occurred at the end of the year 2008. This tragedy happened because Malaysia is in the tropical climate area and its land is covered by more than 80 percent of residual granite and sedimentary rock soil. These types of soil have high possibility to collapse when wetted. The purpose of this study is to examine the collapsibility of Gambang residual soil in Pahang area, which is compared with Bentong residual soil in terms of collapsibility. The oedometer consolidation test is used to determine the consolidation parameters of soil. The testing give result both the residual soil in Gambang and Bentong have significant different on collapse potential. The influence of the particle size distribution, void ratio and density on the collapsibility of soil also has been compared. Determination of collapsibility of residual soil will be one of the best implementation and important in the future.

ABSTRAK

Tanah baki merupakan hasil daripada tindakbalas cuaca dan ciri-cirinya adalah bergantung ke atas persekitaran disebabkan oleh factor iklim, batuan asal, bentuk muka bumi dan saliran serta usianya. Tanah baki yang terhasil apabila batuan asal dikenakan cuaca secara berluasa akan mengakibatkan timbunan tanah keladak. Pada masa kini, kebanyakan tragedi yang diakibatkan oleh keruntuhan pada tanah baki berlaku dengan meluasnya, sebagai contoh kejadian yang berlaku di Bukit Antarabangsa pada penghujung tahun 2008. Tragedi ini berlaku disebabkan Malaysia berada dalam kawasan iklim khatulistiwa dan tanahnya diselaputi dengan tanah jenis granit (batu besi) dan tanah keladak.Tanah jenis ini mempunyai kebolehan yang tinggi untuk runtuh apabila dibasahkan. Kajian ini adalah bertujuan untuk menyelidik keruntuhan tanah baki di Gambang yang terletak dalam kawasan Pahang, di mana ia akan dibandingkan dari aspek keruntuhan dengan tanah baki di Bentong. Odometer digunakan untuk menentukan parameter-parameter bagi kekukuhan sesuatu tanah. Hasil ujian terhadap keruntuhan tanah baki di Gambang menunjukkan terdapat perbezaan yang ketara dengan keruntahan tanah baki di Bentong. Pengaruh daripada pengagihan. saiz zarah-zarah tanah, liang tanah dah ketumpatan yang menyumbang kepada berlakunya keruntuhan juga turut di bandingkan. Mengenal pasti tentang keruntuhan tanah baki ini akan menjadi salah satu aplikasi yang begitu penting pada masa hadapan.

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LIST OF ABBREVIATIONS & SYMBOLS

ASTM	-	American Standard Testing Machine
CP	-	Collapse Potential
w	-	Moisture content
BS	-	British Standard
LL	-	Liquid limit
PL	-	Plastic limit
PI	-	Plasticity Index
G_S	-	Specific gravity

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Residual soils are products of chemical weathering and thus their characteristics are dependent upon environmental factors of climate, parent material, topography and drainage, and age. These conditions are optimized in the tropics where well-drained regions produce reddish lateritic soils rich in iron and aluminum sesquioxides and kaoliriitic clays.

The phenomenon of collapse received considerable attention of many researchers especially due to the residual soils. Criteria for determining susceptibility to collapse and experimental procedure to predict collapse were specifically dealt within several researchers.

Based on the history of landslides, most landslides occur after a heavy downpour. This tragedy happened because Malaysia is in the tropical climate area and its land is

covered by more than 80 percent of residual granite and sedimentary rock soil. Malaysia being a tropical country, naturally receives heavy rainfall throughout the year. It is logic to say that collapsibility phenomenon in Malaysia has influenced by rainfall and the behavior of residual soil.

For that purpose, this study is required to examine the collapsibility of Gambang residual soil in Pahang area which has a high risk to collapse, which will be compared with Bentong residual soil in terms of collapsibility.

1.2 Problems Statements

In general, Malaysia is one of country that have humid tropical climate and more than 75% of its total area land is covered by residual soil which is widely distributed in Peninsular Malaysia. These types of soil have high possibility to collapse when wetted.

Nowadays, most of tragedy that cause by collapsibility of residual soil occurs very extensively, for example the Highland Tower collapsed on December 11, 1993, in Taman Hillview and followed the incident at Bukit Antarabangsa which occured at the end of the year 2008.

From all this influence, the author interested to investigate the area at Gambang which is also has a high possibility to collapse when raining season. Figure 1.1 shows the picture where the area of site investigation of this study. The situation can describe the problem that contributes to collapsibility of the soil as shown in Figure 1.2.

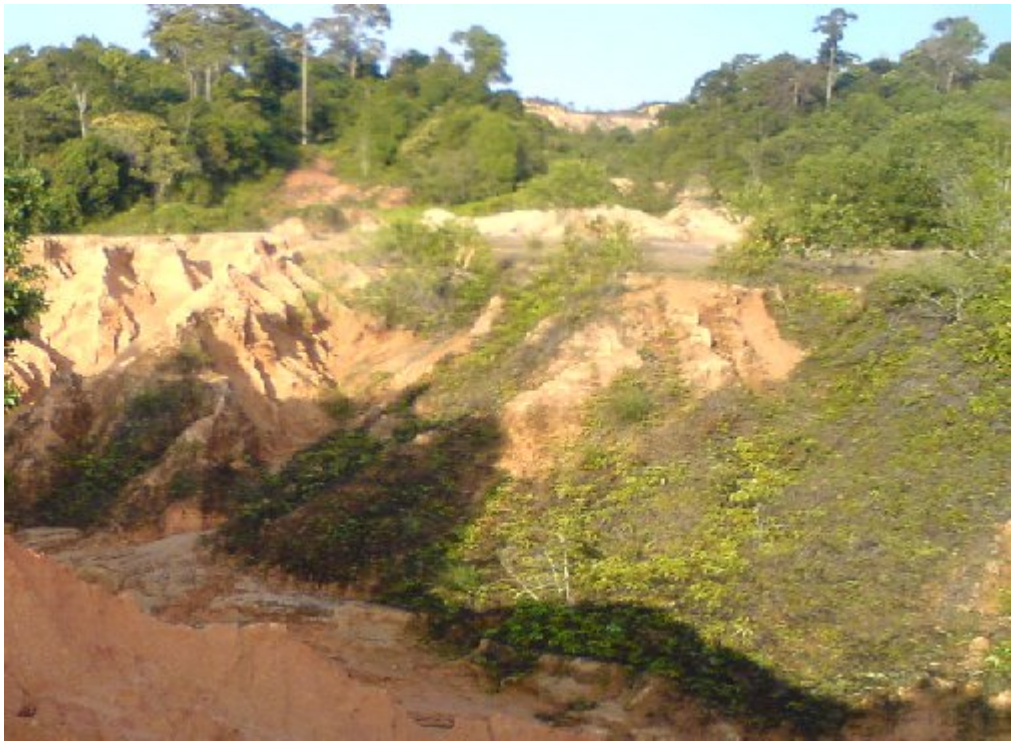

Figure 1.1: Investigation area of collapsibility soil at Gambang

Figure 1.2: The problem caused by collapse of soil at this area of study

1.3 Objectives

The objectives of this study are:

(1) To determine collapsibility rate of Gambang residual soil.

(2) To make comparison between Gambang residual soil and Bentong residual soil in terms of collapsibility.

1.4 Scope of Study

This study was focus on collapsibility of residual soil between two states in Pahang. Two sites were chosen and they are from two different area. The first one is in Bentong and the other is in Gambang. Bentong residual soil had been investigated by previous researcher. For this study, it is only required to investigate the residual soil at Gambang.

The practical technique of taking the sample and simple trimming method have been conducted. There are two types of sample which collected that is disturbed soil and undisturbed soil. The investigation also was carried out for engineering properties and collapsibility rate of Gambang residual soil.

The collapsibility of residual soil was examined using single oedometer test and double oedometer test, in order to measure the potential of collapse of this soil.

Meanwhile, all the data obtained from both tests are used to study the behavior of collapsibility and make the comparison between the Gambang residual soil and Bentong residual soil.

1.5 Thesis Organization

This thesis consists of five chapters. The descriptions of each chapter are described as follows. An introduction of the study is given in Chapter 1. Literature of study described in Chapter 2. In Chapter 3 author describe the methodology. The results and discussions presented in Chapter 4. Finally, in Chapter 5 some conclusions are extracted and include recommendations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review will be focused on the explanation of residual soils, its formation process and characteristic of residual soil. This chapter also covered on the collapsibility of residual soil, and also includes several previous researchers' research about collapsibility of residual soil.

It will also focus on the determination of collapsibility rate at critical area with the methods that are used such as single and double oedometer test, also a series of suction controlled isotropic compression tests and any of the methods that are used in this project.

In world, residual soils cover more of land area and it will become collapsible soil upon wetting. The discussion is on the results from other researchers that show the characteristic of residual soil, their engineering properties, collapsibility rate of soil and the factor that contribute to soil collapse.

On the characterization of engineering properties of residual soils was concern on the natural moisture content, Atterberg limit, specific gravity and void ratio.

The results from other researcher are discussed for comparison in the analysis of results on chapter 4.

2.2 Residual Soils

Residual soils is a soil that formed by the mechanical and chemical weathering of parent rocks at the present location. There is no universally definition of term “residual soils” exists, soils that have weathered in situ are considered residual soil. Since mechanical weathering such as grinding and abrasion, is generally associated with transport agents, residual soil are considered to be products of chemical weathering.

The soil profiles of residual soil are developing from the factors of climate (temperature and rainfall), parent material, water movement (drainage and topography), age and vegetation. Normally, these factors occur in tropical regions where heavy